

10/577712

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/GB2004/004623

AP20 Rec'd PCT/PTO 02 MAY 2006

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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Box No. II Priority

1. ☒ The following document has not been furnished:

- ☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).
- ☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. ☐ The International Searching Authority has not been able to consider the validity of the priority claim because a copy of the earlier application whose priority has been claimed was not available to the International Searching Authority at the time that the search was conducted (Rule 17.1). This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.
4. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|---------------------------|
| Novelty (N) | Yes: Claims | 5-7,9,10,15-25 |
| | No: Claims | 1-4,8,11-14 |
| Inventive step (IS) | Yes: Claims | 5-7,9,10,16,19, 20, 23-25 |
| | No: Claims | 1-4,8,11-15,17,18, 21, 22 |
| Industrial applicability (IA) | Yes: Claims | 1-25 |
| | No: Claims | |

2. Citations and explanations

see separate sheet

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International Application No. 2006
AP20 Rec'd PCT/JP 02 MAY 2006
PCT/GB2004/004623

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: US-A-6 091 535 (SATO ET AL) 18 July 2000

D2: EP-A-0 975 104 (LUCENT TECHNOLOGIES INC) 26 January 2000.

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent claim 1 is not new in the sense of Article 33(2) PCT.

The document D1 discloses (the references in parentheses applying to this document):

"A method of adapting an information carrying signal (figure 1: optical output "Po" carrying information from electrical input signal "Si") that comprises a plurality of data pulses (figure 8A shows data sent by the transmitter of figure 1 as indicated in column 5, lines 64-66: "FIG. 8A shows examples of optical pulse waveforms leaving the modulator") that exhibit a range of pulsewidths (figure 8A: pulses have different pulsewidths) and which are generated by a transmitter (column 5, lines 64-66: "FIG. 8A shows examples of optical pulse waveforms leaving the modulator") for transmission through a propagation medium (column 6, lines 17-18: "FIG. 9 shows the effect of transmitting a positively chirped pulse through an optical fiber"), the method comprising the step of introducing one or more sub-pulses to one or more of the plurality of data pulses (figure 1 and column 7, lines 28-30: "The Mach-Zehnder modulator 2 generates a positive chirp". Figures 8A and 8B illustrate the transmitted data signal and the positive chirp generated, showing that the chirp corresponds to sub-pulses introduced to the data pulses) prior to the information carrying signal entering the signal propagation medium (figure 1 and column 7, lines 28-30: "The Mach-Zehnder modulator 2 generates a positive chirp", where the modulator is placed before the propagation medium) wherein a pulsewidth of each of the one or more sub-pulses is less than a minimum pulsewidth of the plurality of data pulses

(figures 8A, 8B, 8C, 9 and 10 as well as column 6, lines 34-36: "then the chirp due to the modulator can compensate for the chirp produced in the fiber" all point to the fact that the pulsewidth of each sub-pulse is of the order of a data pulse edge, thus shorter than the pulsewidth of an entire data pulse)."

Therefore the subject-matter of claim 1 is not new.

The applicant should also note that document D2 (see figures 1-3) also discloses the subject-matter of claim 1.

3. The subject-matter of independent claim 17 does not involve an inventive step in the sense of Article 33(3) PCT.

The document D2 discloses (the references in parentheses applying to this document):

An electronic circuit suitable for adapting an electronic input signal of a transmitter (figure 1: input "D"), the electronic input signal comprising a plurality of electrical data pulses (figure 3b: " V_D "), the electronic circuit comprises an electronic input channel (figure 1: input "D"), a clock pulse phase delay circuit (figure 2: voltage controlled oscillator "2" and column 3, lines 36-37: "to synchronise the oscillator 2 to a reference clock signal"), a signal processor (figures 1 and 2: all the system elements between the inputs and output) and an optical output channel (figure 1: output "O") wherein the signal processor analyses one or more of the plurality of electrical data pulses (figure 1: processing elements connected to the input of "D") supplied on the electronic input channel and one or more clock pulse phase delay signals (figure 2 and column 3, lines 36-37: "to synchronise the oscillator 2 to a reference clock signal") provided by the clock pulse phase delay circuit so as to introduce one or more optical sub-pulses to one or more of the plurality of electrical data pulses (figures 1, 3a and 3b: Sub-pulses "RZ" are introduced to data pulses "D" via the modulator "4") so as to provide an adapted optical output signal on the optical output channel.

Therefore, the subject-matter of claim 17 differs from the disclosure of document D2 in that in the subject-matter of claim 17,

the sub-pulses and the output signal are generated in the electrical domain.

The objective technical problem to be solved by the subject-matter of claim 17 can therefore be regarded as:

How to adapt the system of document D2 to an all-electrical system?

The solution proposed in claim 17 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT), the reason being as follows:

Replacing optical elements by their electrical equivalent to process and generate electrical signals instead of optical signals is obvious to the skilled person.

4. Dependent claims 2-4, 8, 11-14, 15, 18, 21 and 22 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty or inventive step, the reasons being as follows:
 - 4.1 Claim 2: In document D1, figures 8A and 8B, the sub-pulses introduced to the falling edges of the data pulses have an amplitude of opposite sign to the amplitude of their associated data pulse.
 - 4.2 Claim 3: In document D1, figures 8A and 8B, the sub-pulses occur within the time span of their associated data pulse, which is confirmed by column 6, lines 34-36 of the description: "then the chirp due to the modulator can compensate for the chirp produced in the fiber".
 - 4.3 Claim 4: In document D1, figures 8A and 8B, each sub-pulses coincides with an edge of a data pulse.

- 4.4 Claim 8: In document D1, figures 8A and 8B, the timing of each sub-pulse corresponds to an edge of a data pulse. The timing of the data pulse edges is variable as it depends on the data itself, which is variable. Therefore the timing of sub-pulses is variable.
- 4.5 Claims 11-14: In document D1, figures 9 and 10 illustrate the fact that chirping by the modulator causes time shifts at the rising and falling edges of a data pulse, particularly advancing in time the rising edge and delaying in time the falling edge (see figure 9: "AFTER").
- 4.6 Claim 15: The fact that the time shift of the edge of data pulses is predetermined, as opposed to being calculated in real-time in a feed-back loop as in document D1 does not constitute an inventive step.
- 4.7 Claim 18: In the figure 3 of document D2, it is clear that sub-pulses "P_{RZ}" occur within the time span of their associated data pulse "V_D".
- 4.8 Claims 21-22: The use of an "internal signal pulse" is a normal design option to the skilled person.
5. The combination of the features of dependent claims 5-7, 9-10 and 16 is neither known from, nor rendered obvious by the available prior art. The reasons are as follows:

None of the prior art documents disclose or hint at:

- a condition to the introduction of sub-pulses for filtering (claims 5-6);
- a dependence between the number and pulsewidth of sub-pulses on one hand and the pulsewidth of the associated data pulses on the other hand (claims 7, 9, 10);
- a dependence between the shifting of data pulse edges and the pulsewidth of data pulses (claim 16).

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6. Additionally, the combination of the features of dependent claims 19, 20 and 23-25 is neither known from, nor rendered obvious by the available prior art. The reasons are as follows:

None of the prior art documents disclose or hint at a use of phase delayed clock pulses for altering data pulses in the system claimed.